# Stuck of Catheter

## *- Cautions and Salvage -*

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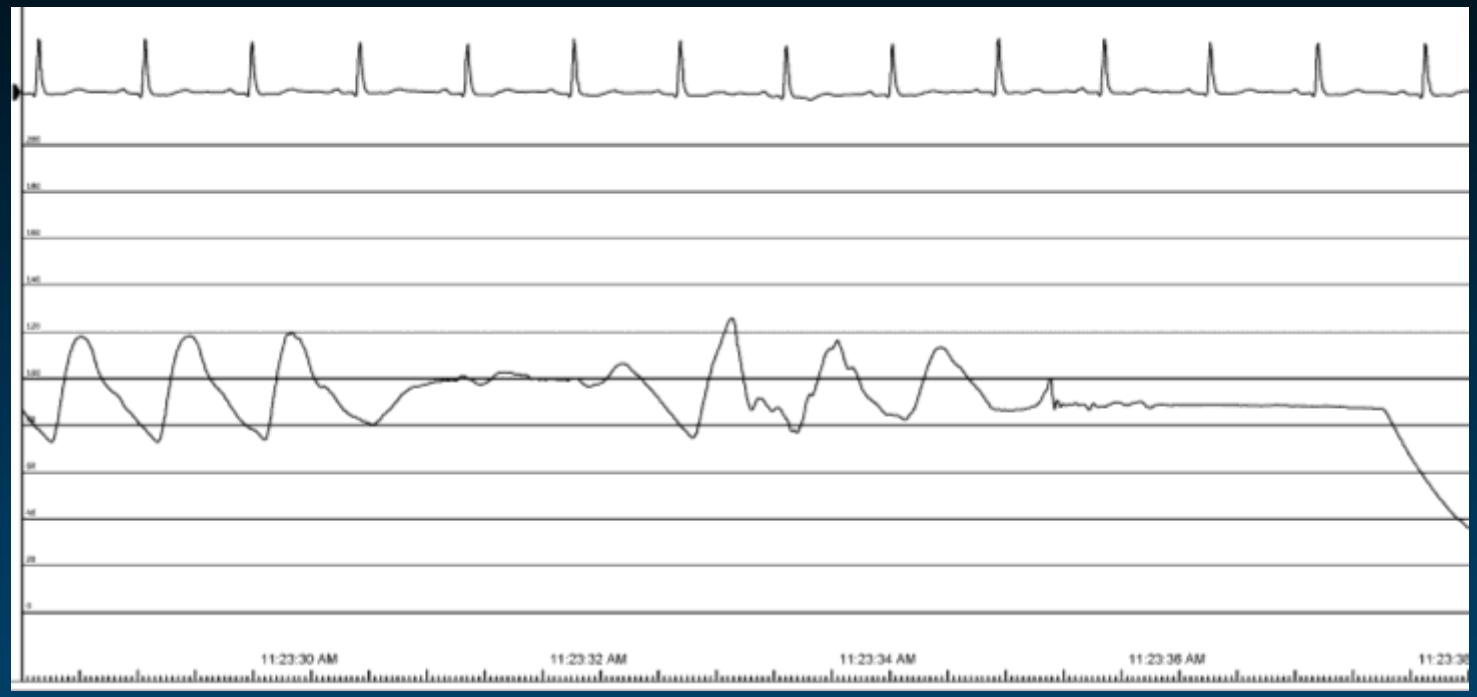
**Cardiovascular Center in**
**Chungnam National University Hospital**

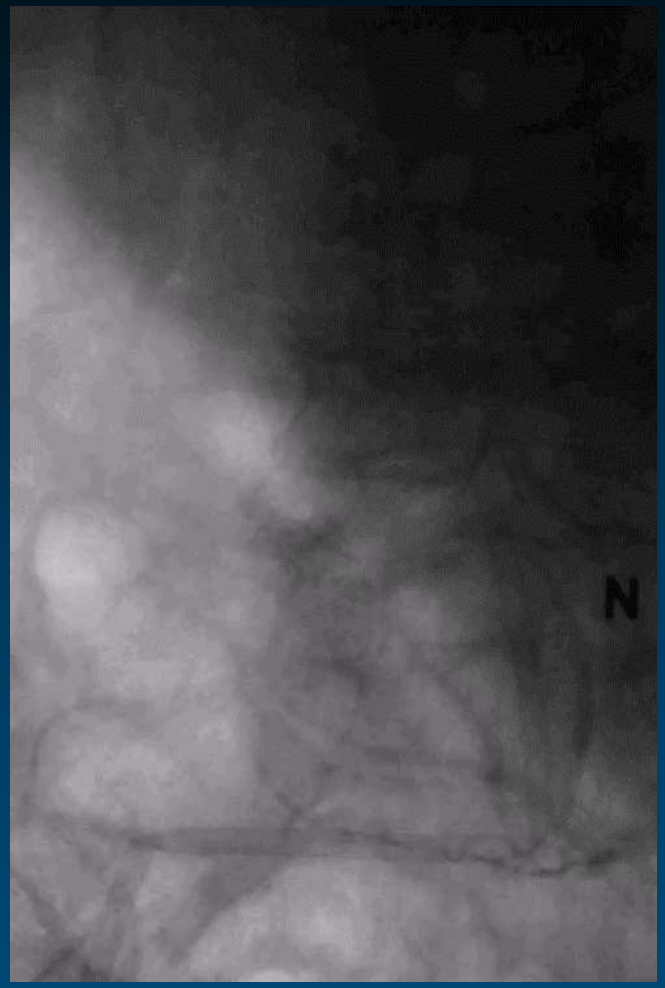
# Typical Case - Catheter Knotting (TF)

Angulated aortoiliac calcification




**Difficulty with torque**
**Catheter does not respond**
**Loss of pressure waveform**

# Typical Case - Catheter Knotting (TF)



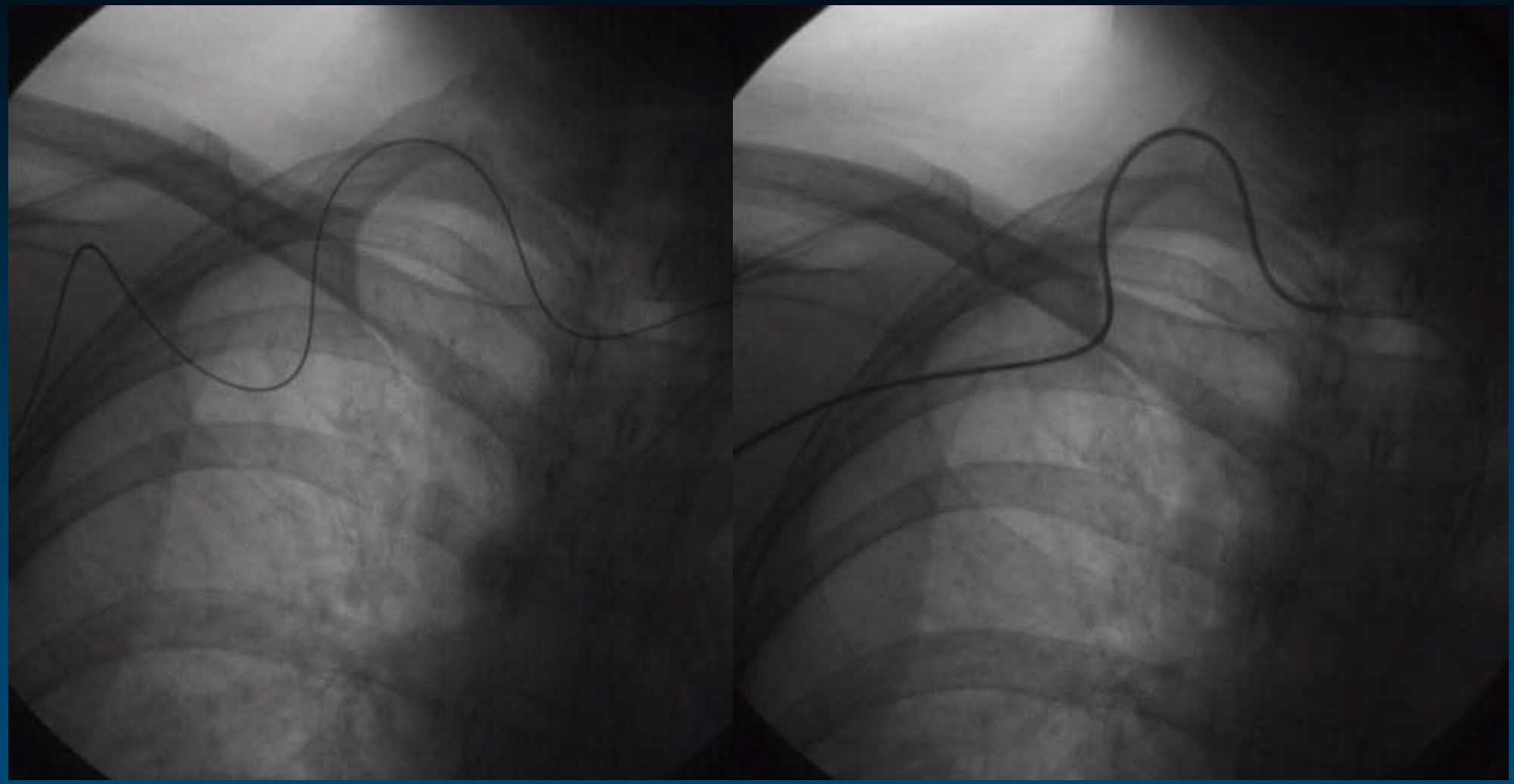
Catheter knotting & kinking
→ Reverse torque and removal

Replaced to long femoral sheath
24~65 cm, longer the better

# Stuck / Knotting / Fracture of Catheter
## *Plausible Mechanisms?*

- **Overtorquing in the setting of:**
  - **Tortuosity;**
    - **TF; Calcified aortoiliac angulation**
    - **TR; Subclavian tortuosity, Radial loop**
  - **Calcification**
  - **Narrow arterial caliber;**
    - **Small radial caliber, High take-off radial artery**
  - **Arterial spasm**
  - **Mixture of above**

# How to Overcome Subclavian Tortuosity ?



**Subclavian and axillary tortuosity**

**→ Overcame by an 0.035” Amplatzer Superstiff GW**

# How To Overcome Radial Artery Loop

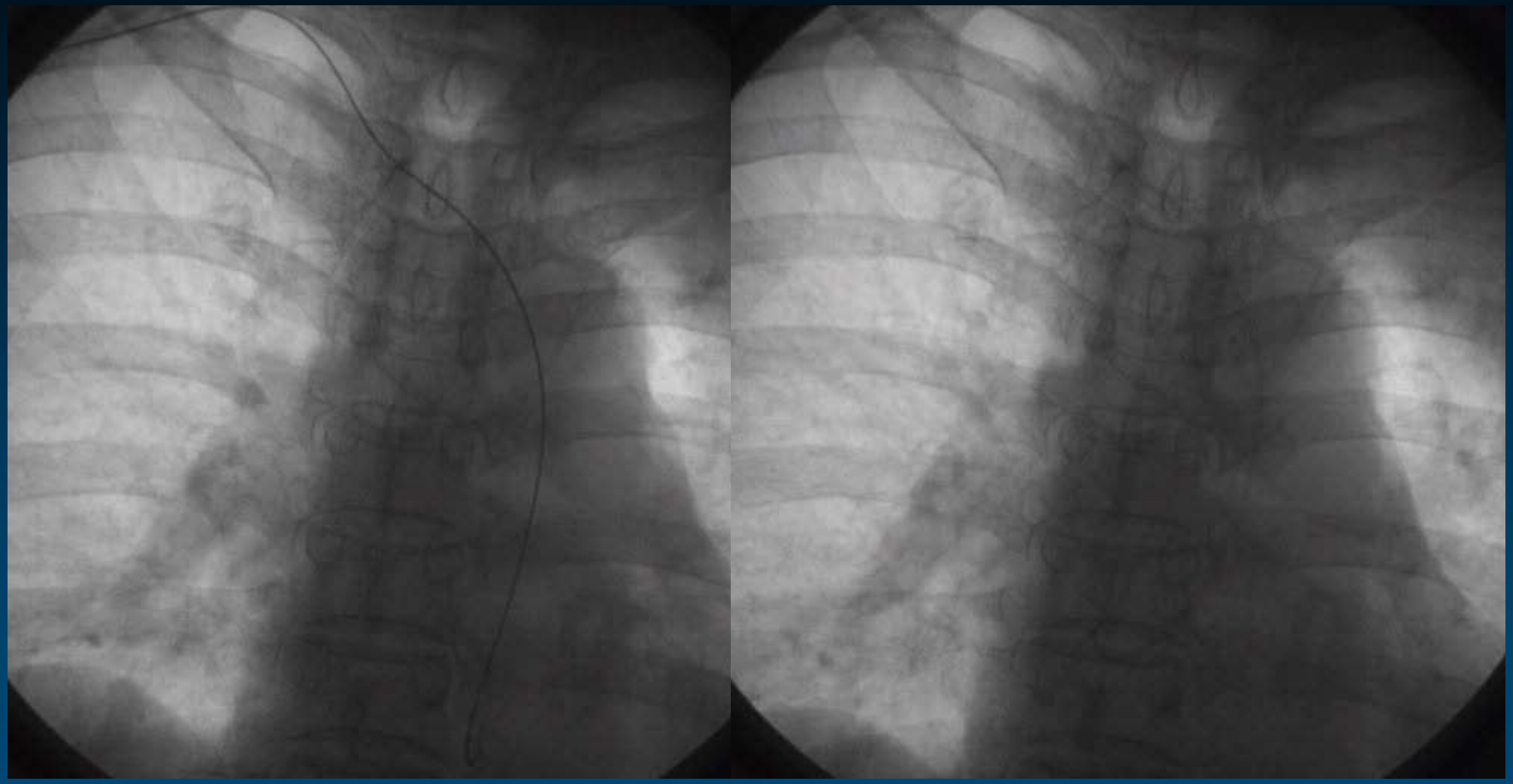
**Road map → 0.014” GW**

# How To Overcome Radial Artery Loop

4 Fr JR Along 0.014” GW

Pull & Clockwise rotation

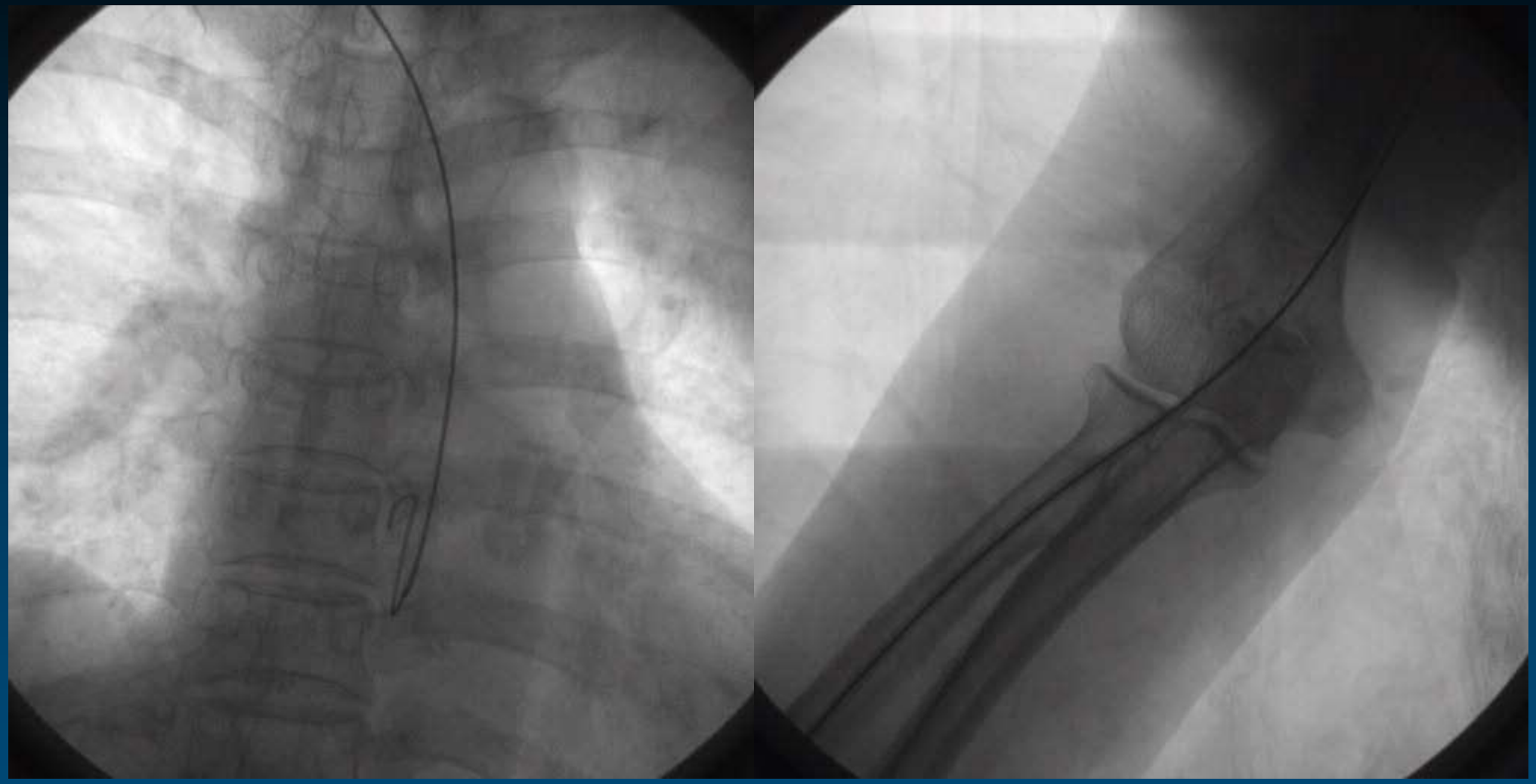
# How To Overcome Radial Artery Loop



0.035” Terumo wire

4 Fr JR in aorta

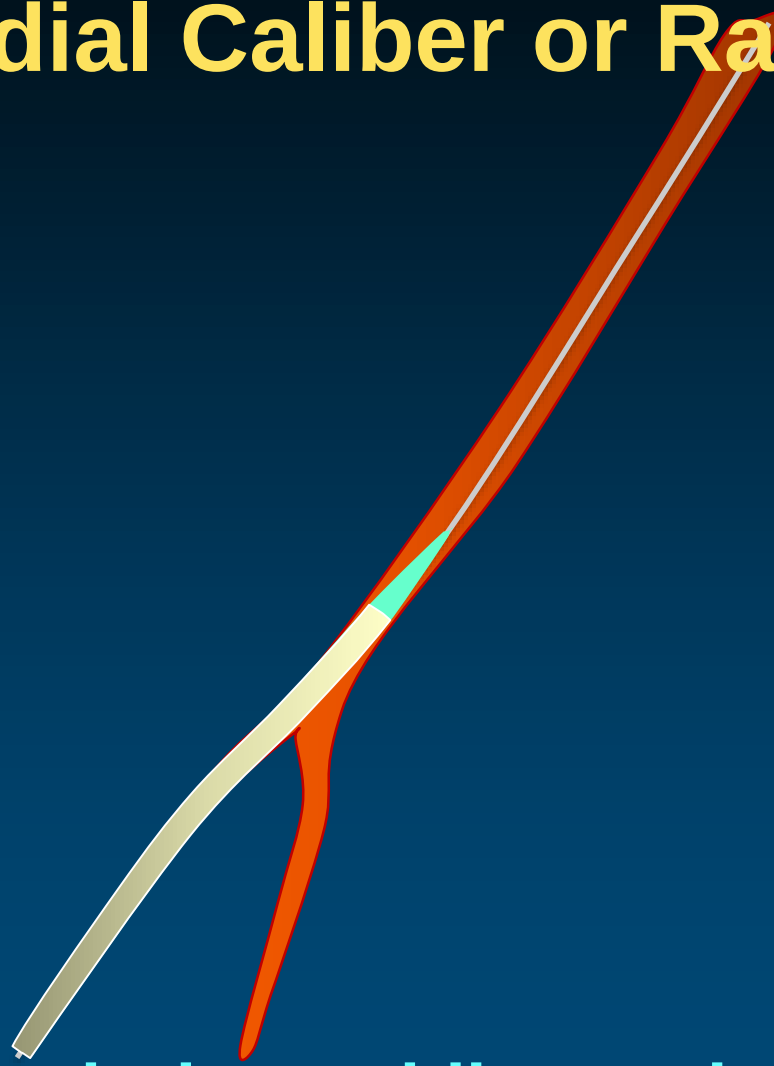
# How To Overcome Radial Artery Loop



0.035” Amplatzer Extrastiff wire

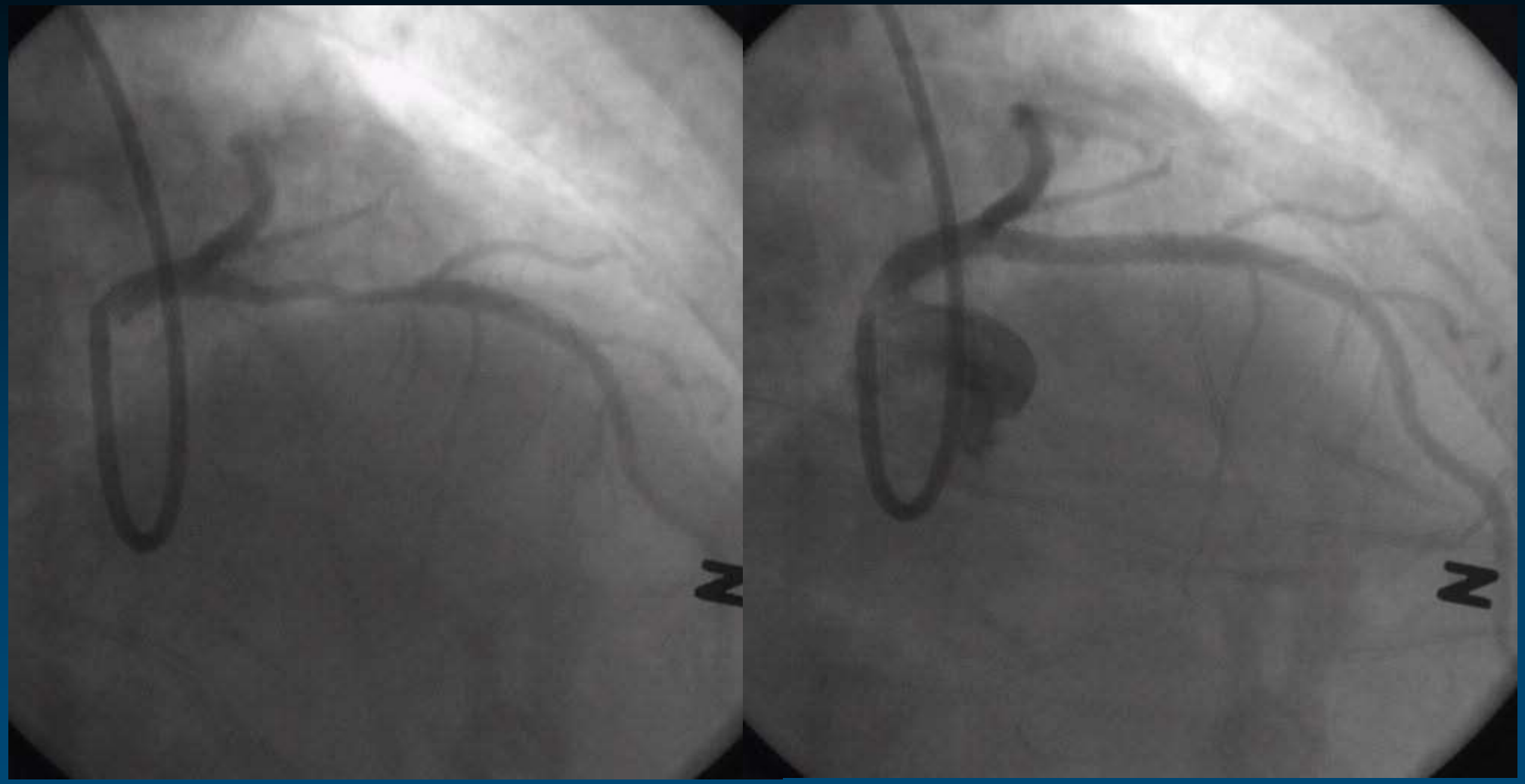
6 Fr Long Terumo sheath

# 5-6 Fr Long Terumo Sheath For Small Radial Caliber or Radial Loop



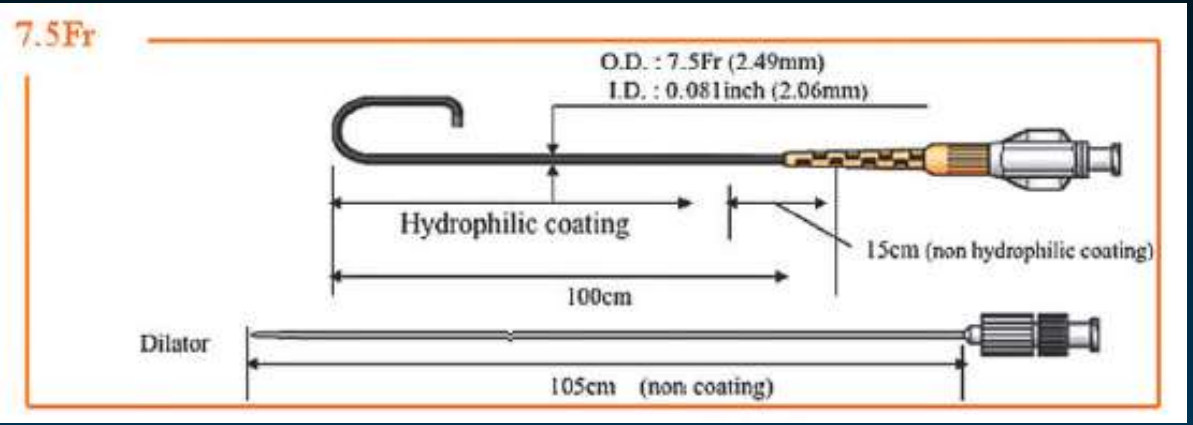
If you feel any friction during guiding catheter entry in the RA
→ Replace with long Terumo sheath (5-6 Fr) or Sheathless guide

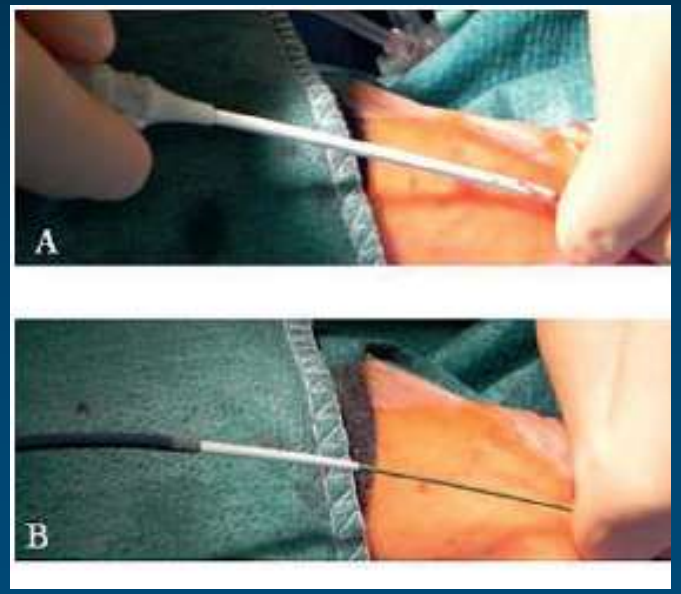
# How To Overcome Radial Artery Loop

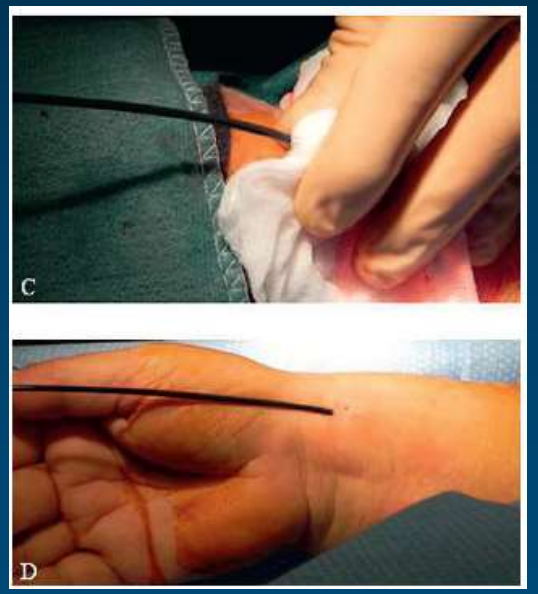


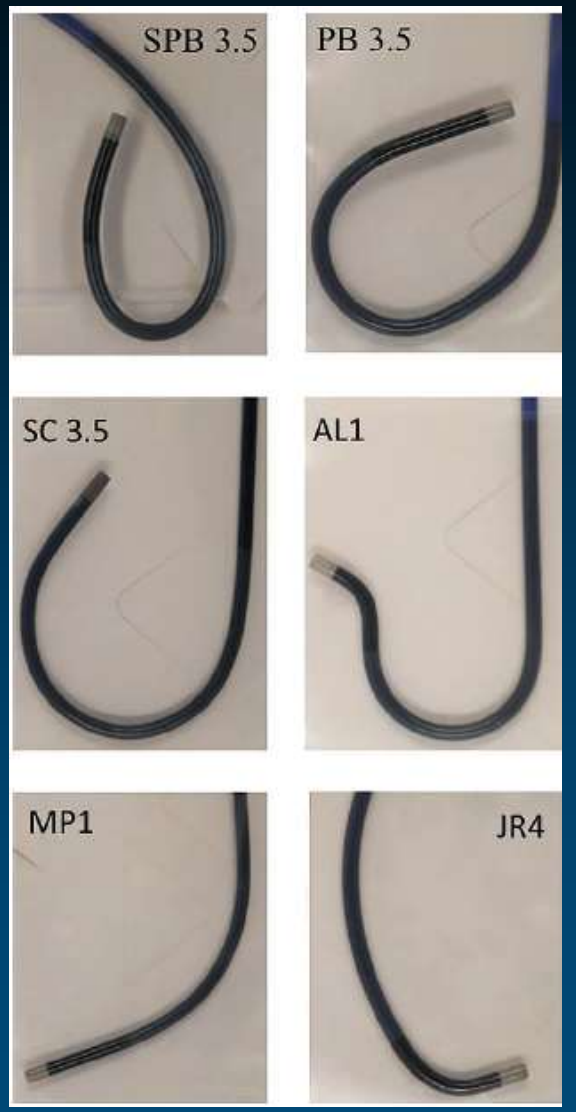
6Fr EBU intervention

# Sheathless Catheters



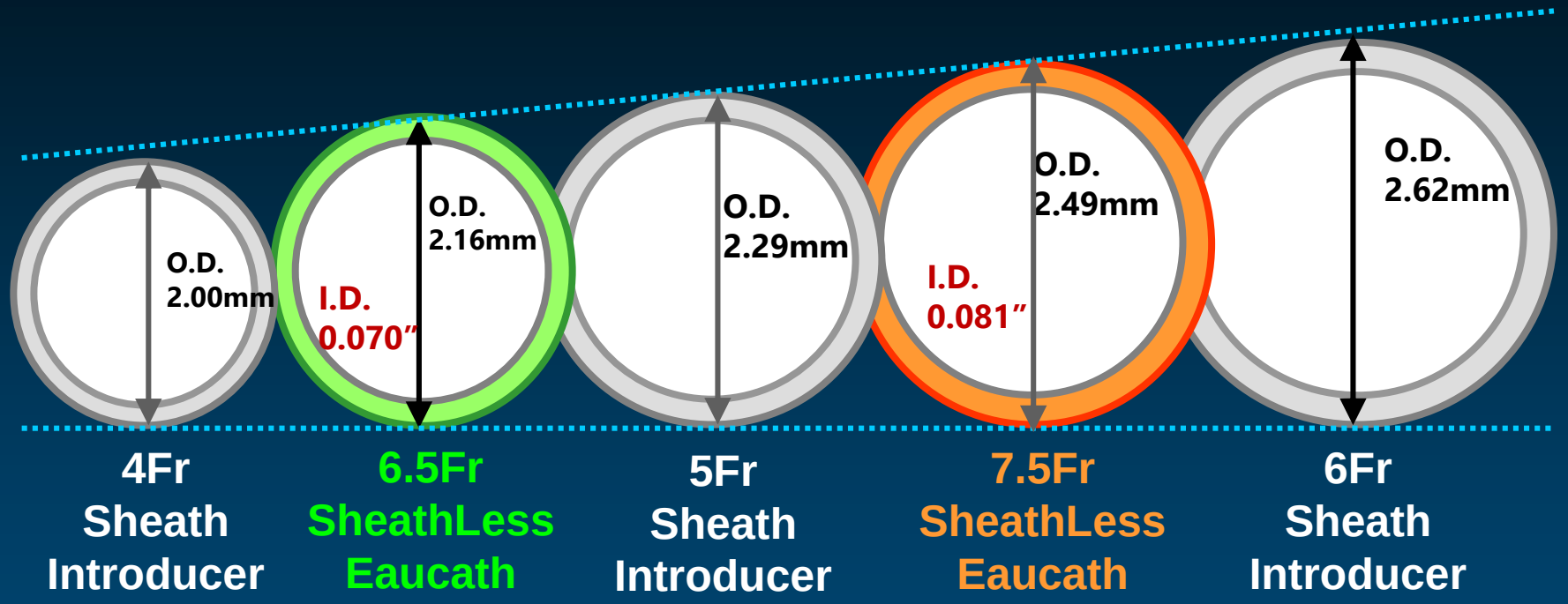



# Sheathless vs. Sheath

## Radifocus Introducer II vs. Medtronic Launcher




**4.5Fr sheath (OD)**
**6 Fr guiding (ID)**

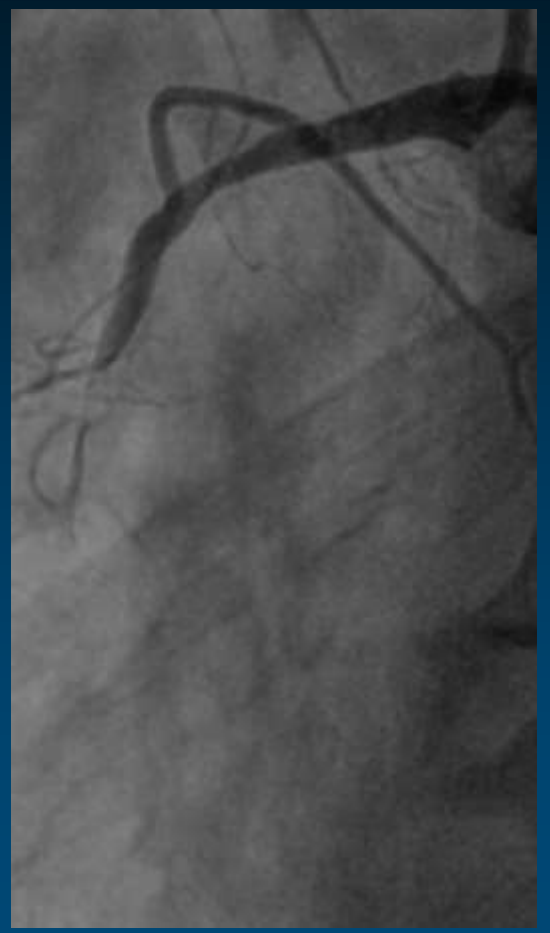
**5.5Fr sheath (OD)**
**7 Fr guiding (ID)**

*Heart, Lung and Circulation, Volume 22, Issue 3, 2013, 188 - 192*

# RCA Intervention In a Radial Loop

## *With a 6.5 Fr Sheathless Guide (≅4.5 Fr OD)*

Terumo + 4 Fr JR



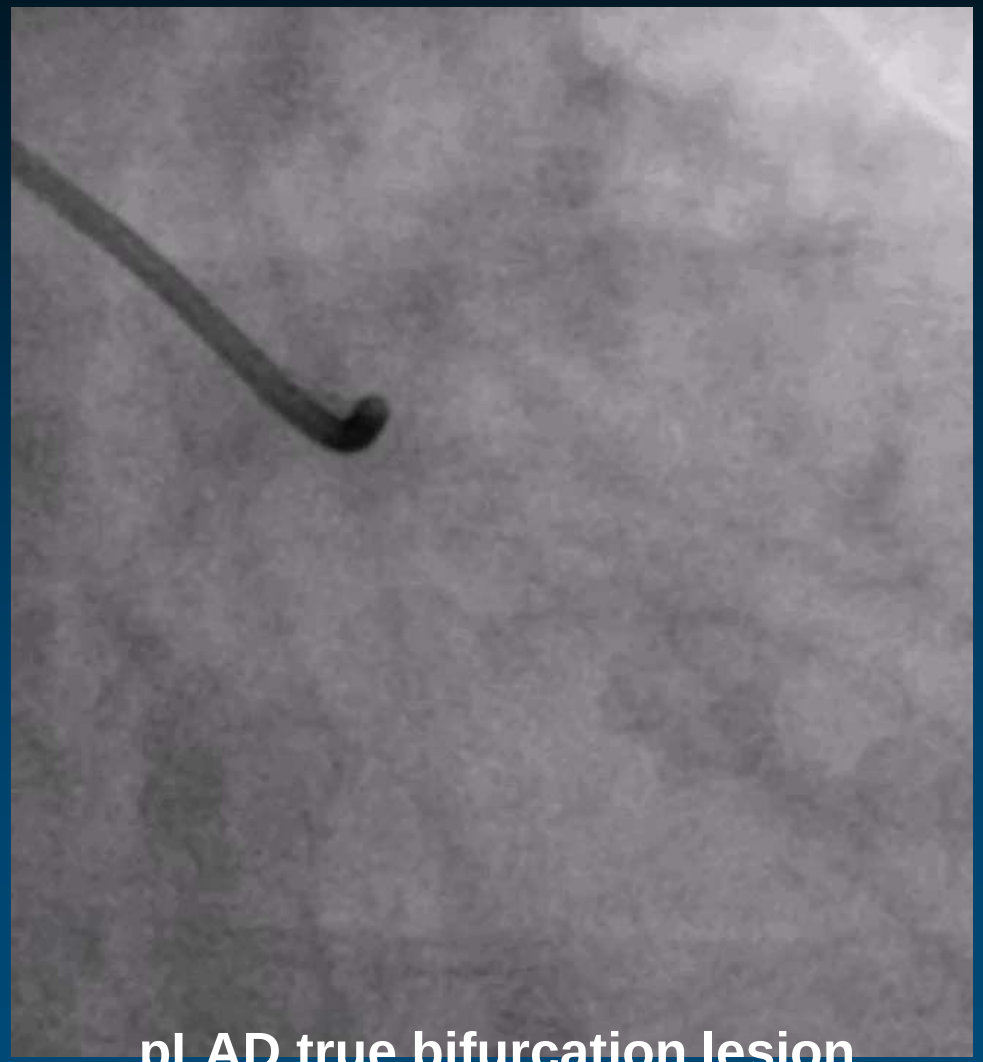
Amplatzer stiffwire +

6.5 Fr Sheathless guide (≅4.5 Fr OD)

# Bifurcation Lesion PCI in High Take-Off Radial

## *With a 6.5 Fr Sheathless Guide (≅4.5 Fr OD)*

High take-off radial artery
Small caliber, 5 Fr diagnostic

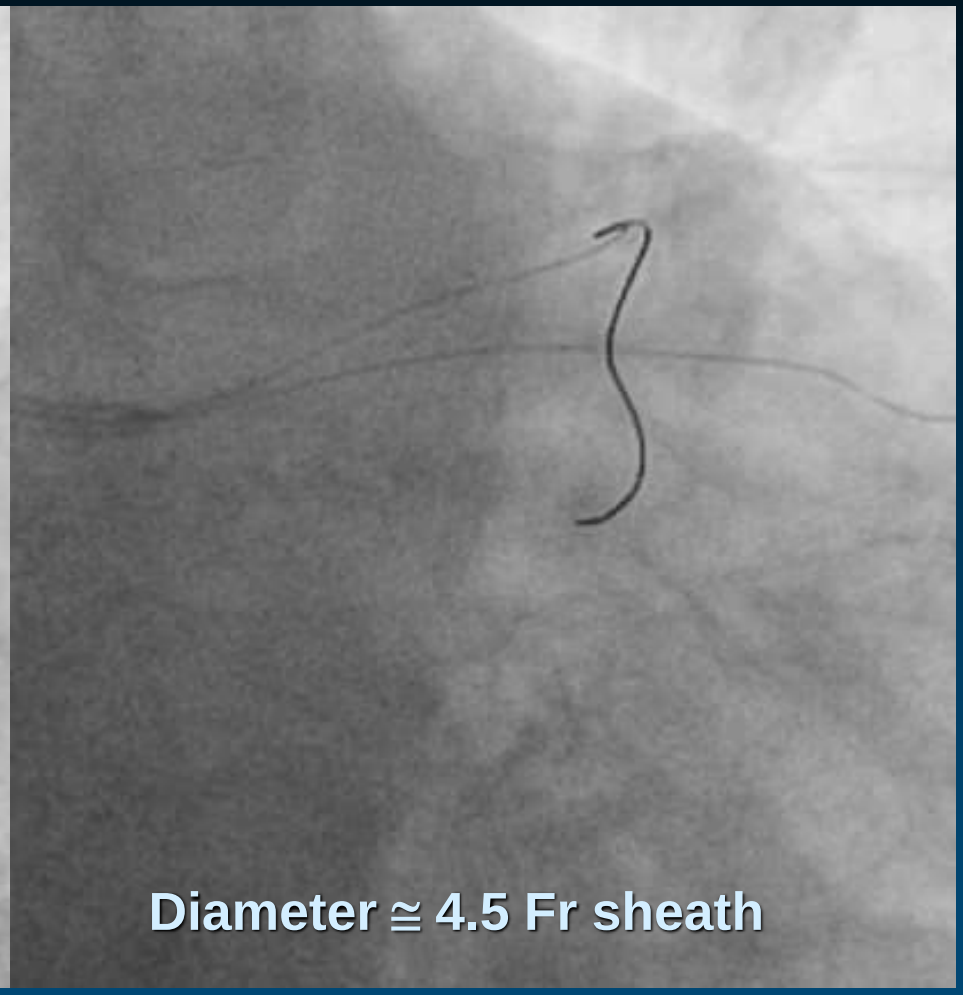


pLAD true bifurcation lesion
→ Switch to transfemoral?

61 YO woman
Unstable angina

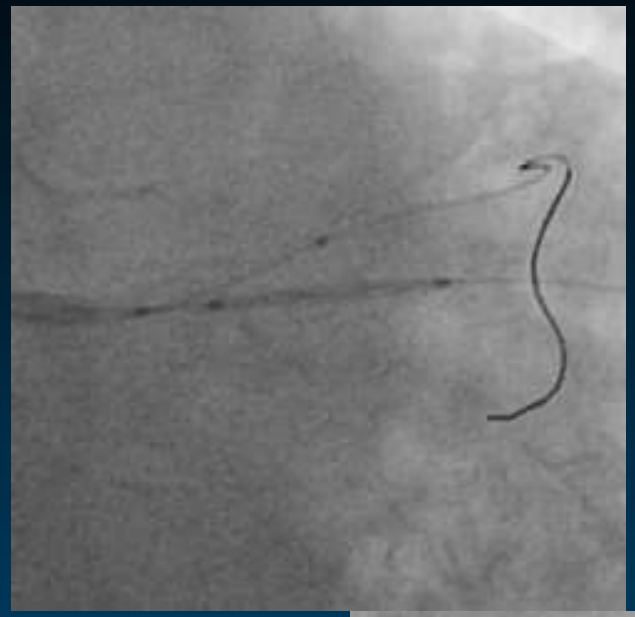
# Crushing with 6.5 Fr Sheathless Guide

6.5 Fr sheathless PB Guide

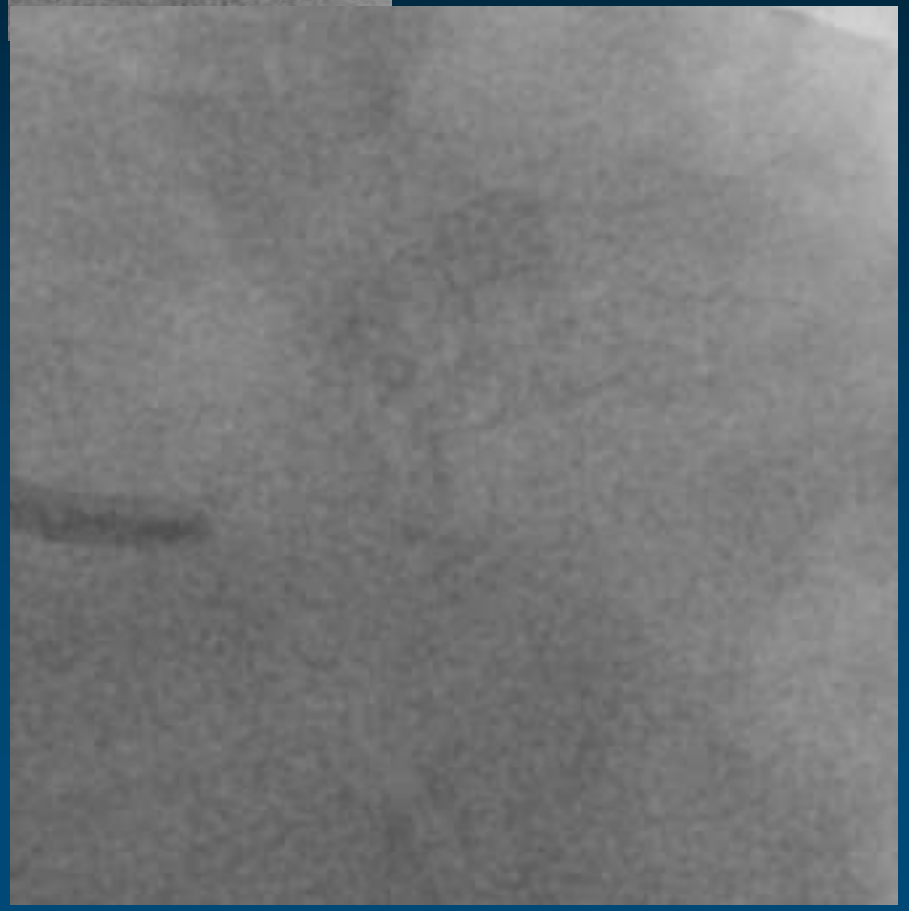



6.5 Fr sheathless JL Guide

# Crushing with 6.5 Fr Sheathless Guide



Final kissing
4.0 & 3.0



4.5Fr compatible OD
No radial damage

LAD DES
4.0×15

# Stuck / Knotting / Fracture of Catheter
## *Prevention?*

- Catheter manipulation
  - Increase to-and-fro motion / Reduce rotational motion
  - Wire in catheter technique during catheter manipulation
    ; Prepare 0.035” stiff GW in your cath lab
    such as Amplatzer super- or extrastiff GW
  - Watch catheter response to torque
  - Watch pressure wave form
- Use long radial / femoral sheath if it needed

# Case – Complete Catheter Knotting (TR)

**What's Next ?**

**Reverse torque**
**→ Only the loop is spinning**

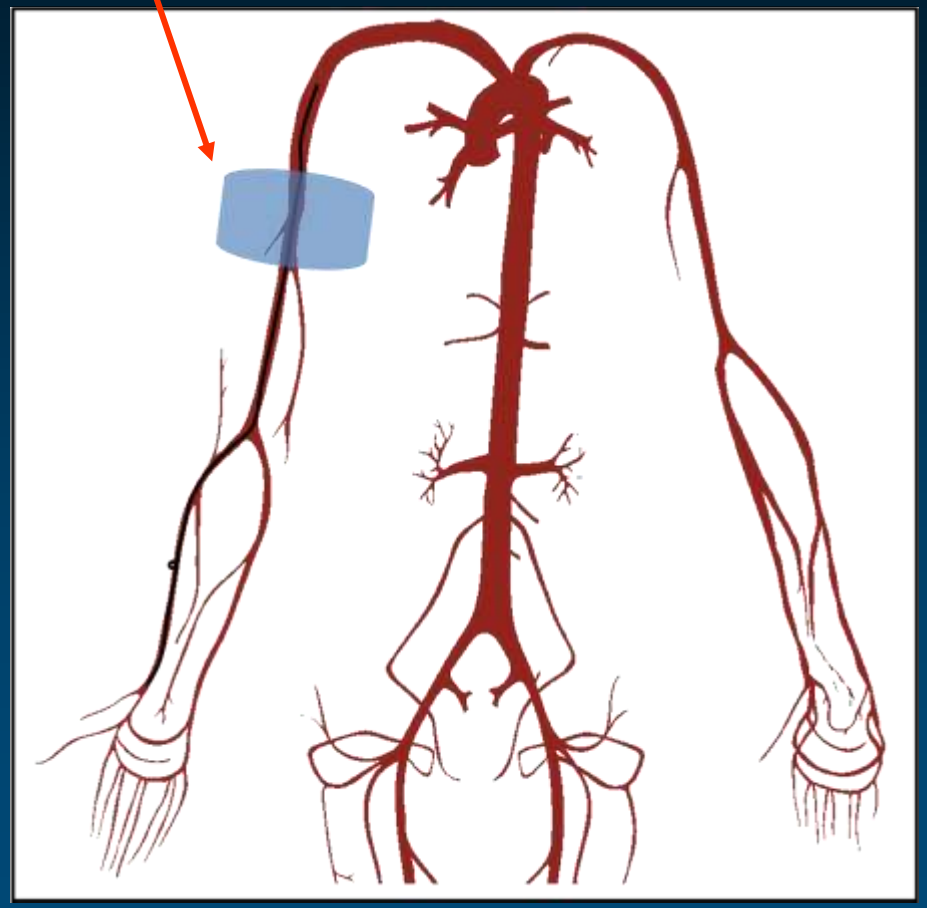
**Wire the catheter to straighten and remove**
**→ Impossible**

# Grandma – Mother – Child Technique
## *Facilitate the Passage Through Knotting*

**Knotted catheter + 4 Fr MP (Glide) + CXI + 0.018” GW**

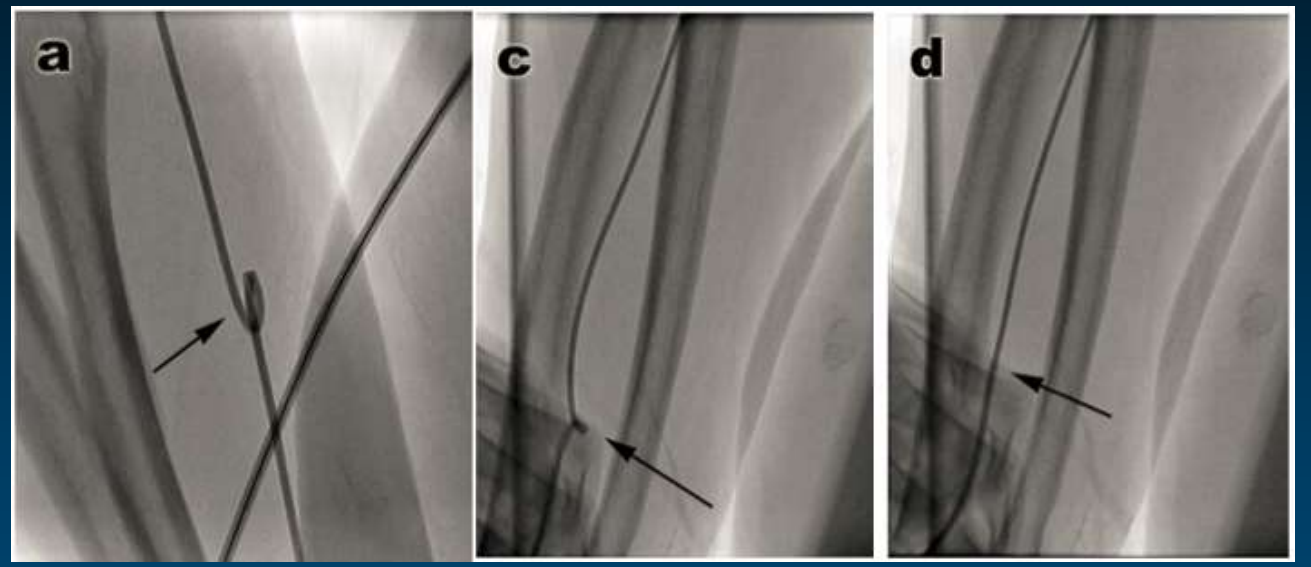
# External Fixation;
## *BP Cuff Technique*

BP Cuff to 200 mmHg



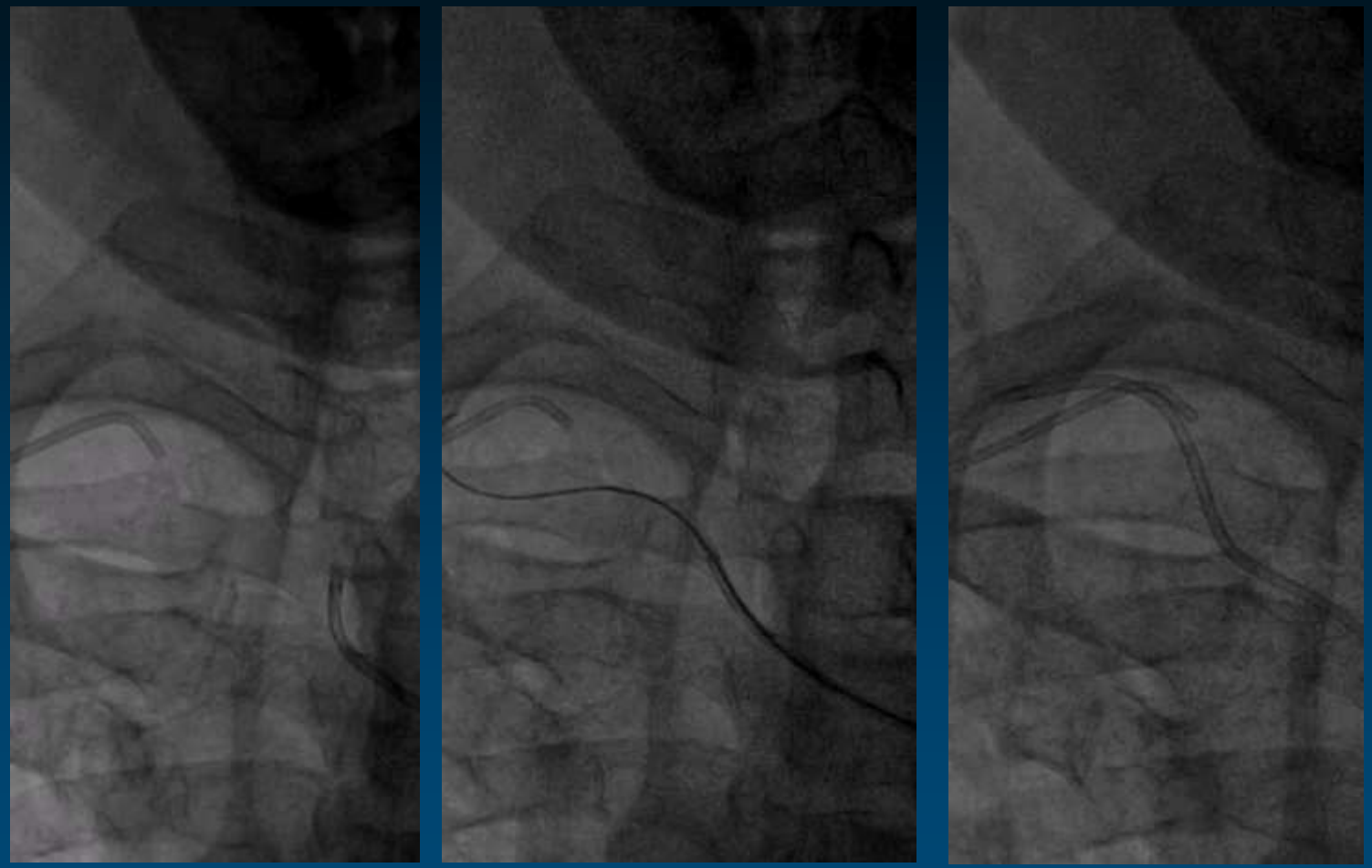
Serajian A, et al. Vasc Dis Mgmt 2013

# External Torque;
## *Manual Manipulation*

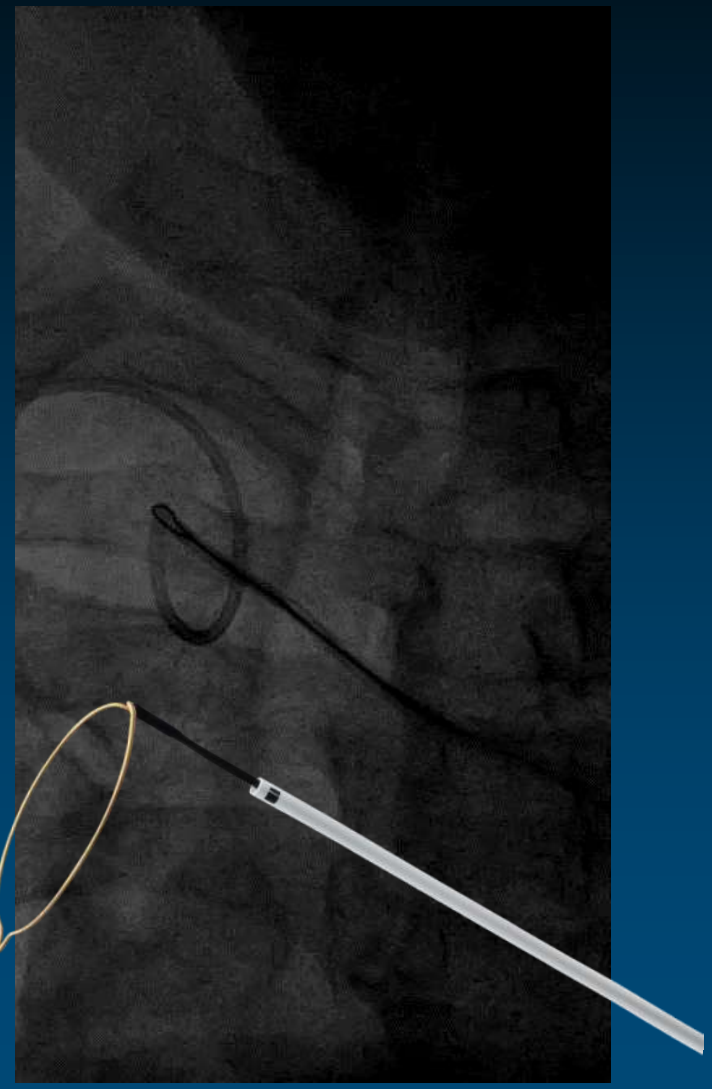



Patel T, et al. J Inv Cardiol 2013

# Internal Fixation – Femoral Snare Technique

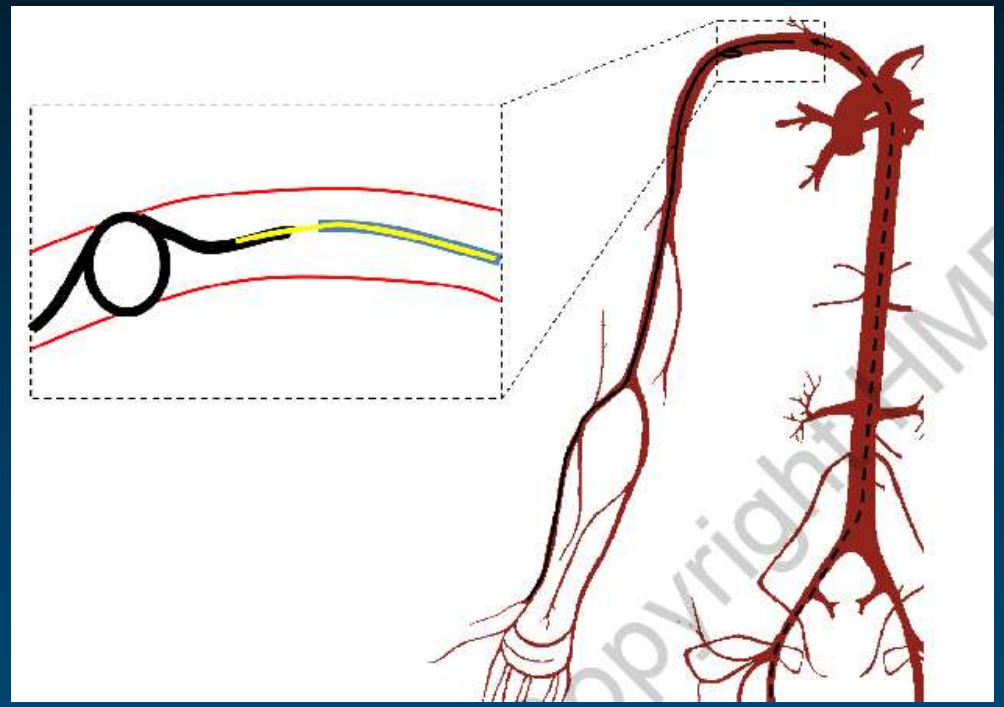


5 Fr Femoral → 5 Fr JR → Snare the catheter tip

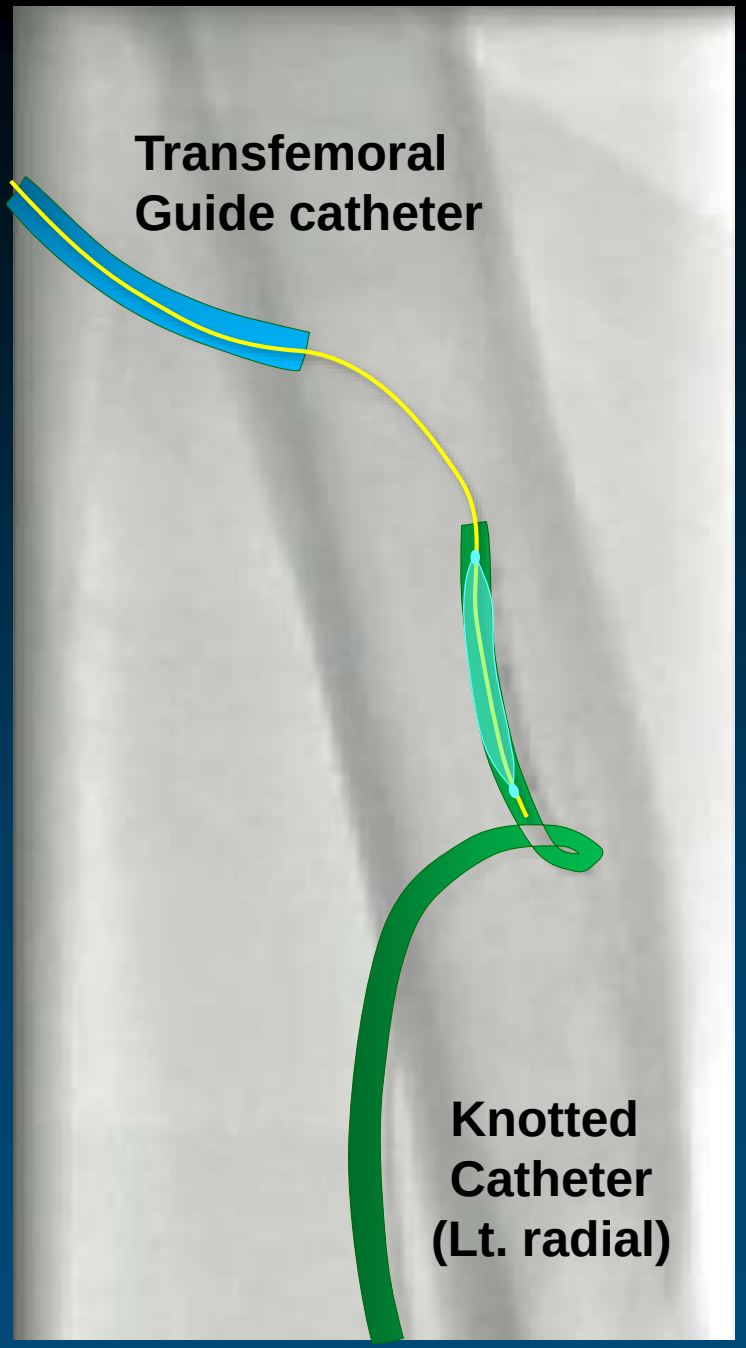


Reverse torque from the femoral

# Internal Balloon Retrieval Technique



Serajian A, et al. Vasc Dis Mgmt 2013

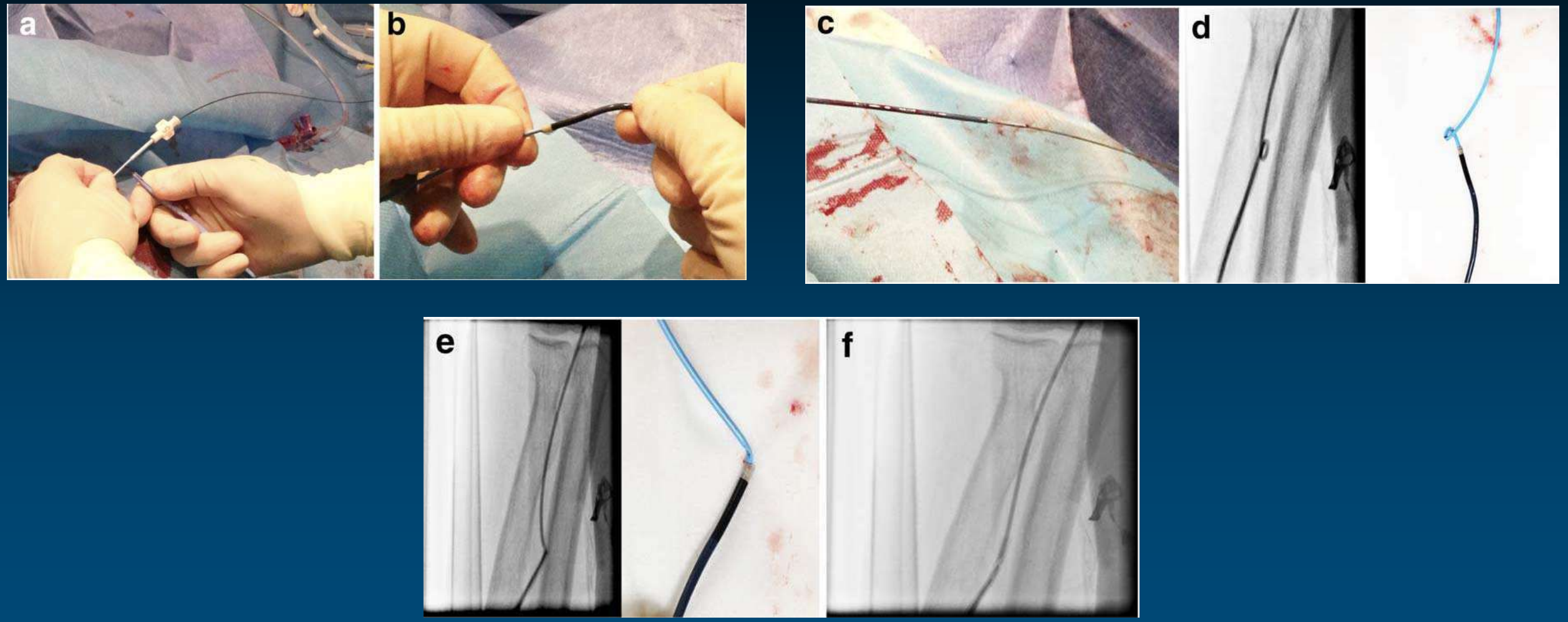



Layland J et al, J Inv Cardiol. 2012

**Our patient,**

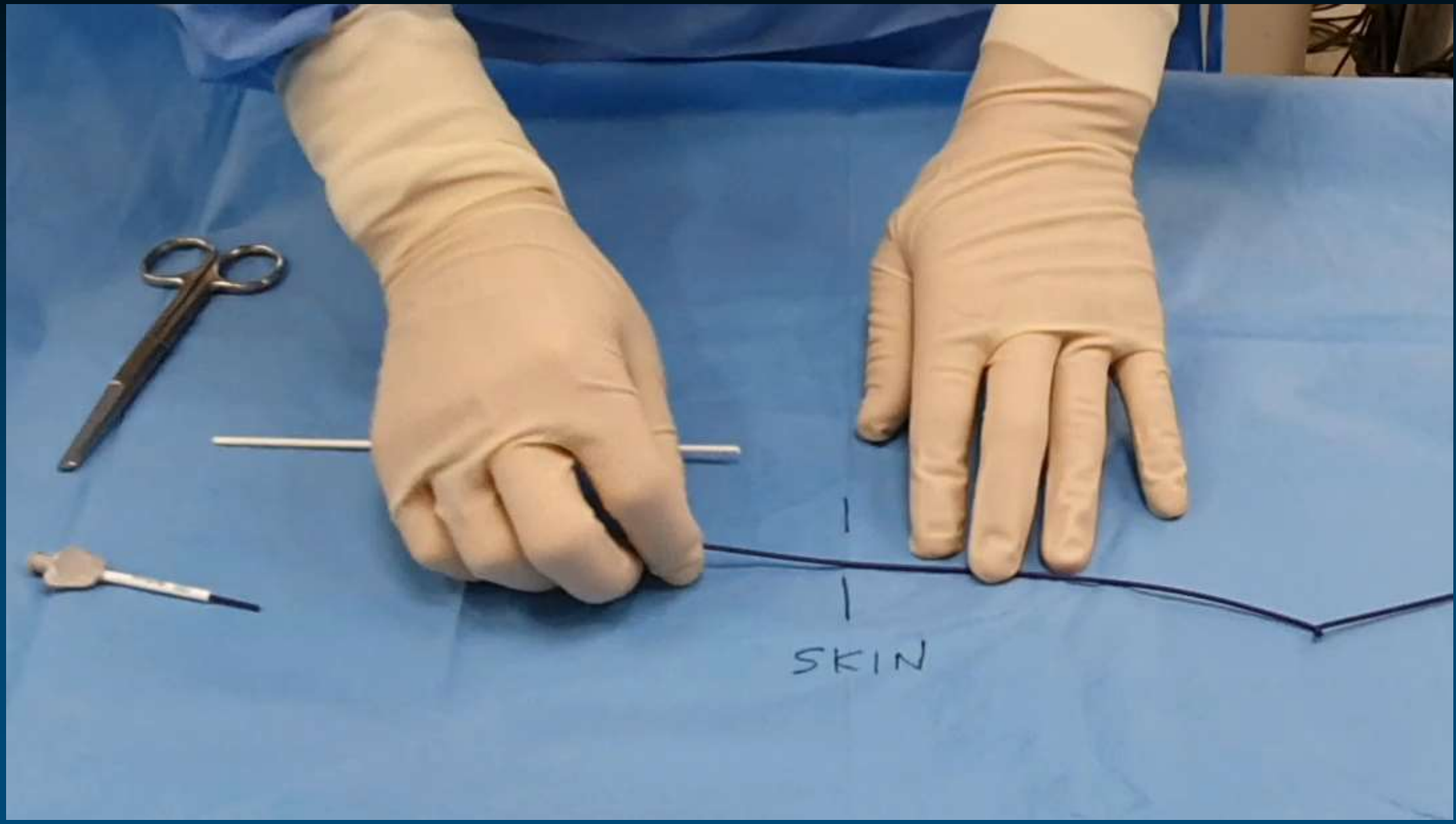
**Still Knotted, What's Next?**

# Long Sheath/Guide Technique




Aminian et al. Card Cath Interven 2015

# Long Sheath/Guide Technique



# Long Sheath Technique

Cut proximal end of the knotted catheter

Sometimes you may have to cut the sheath

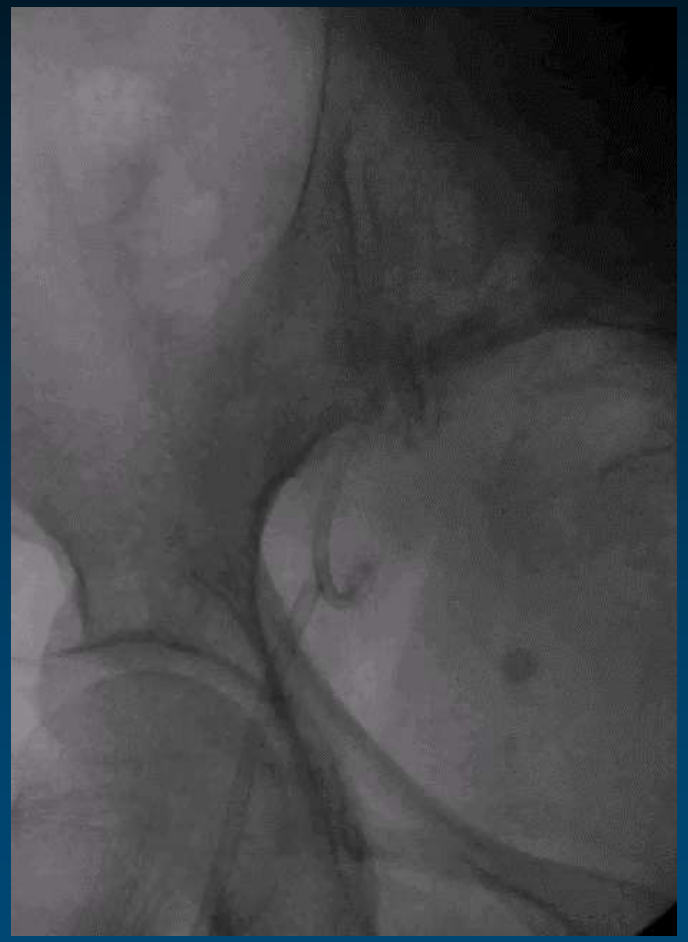
Replace sheath with a 1 Fr bigger

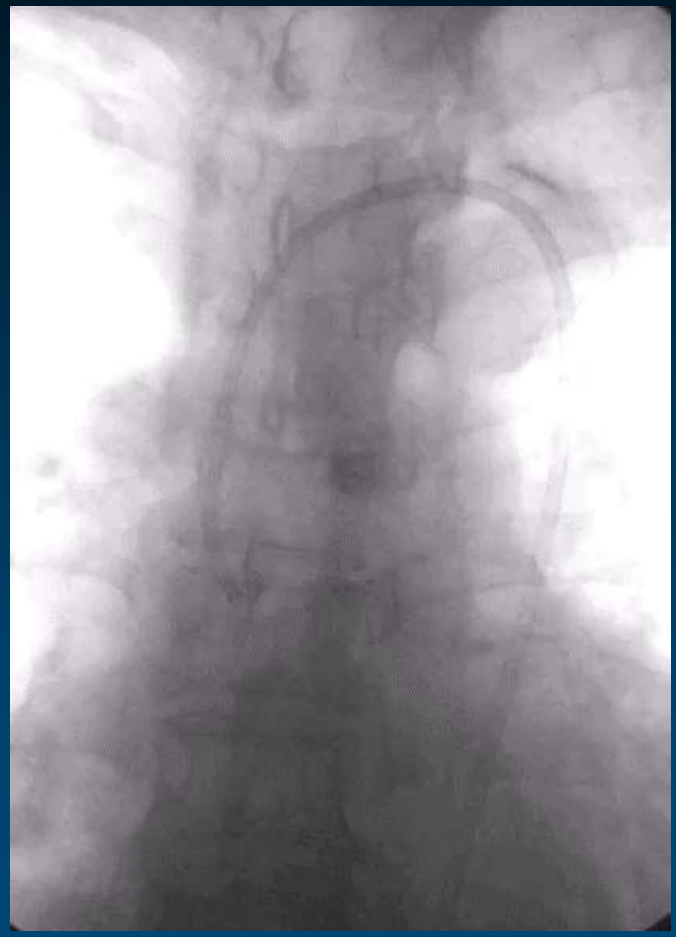
- trapped catheter act as a introducer

Advance long sheath to the base of the kink

Unravel and gently pull back trapped catheter

# Case - Catheter Fracture (TF)

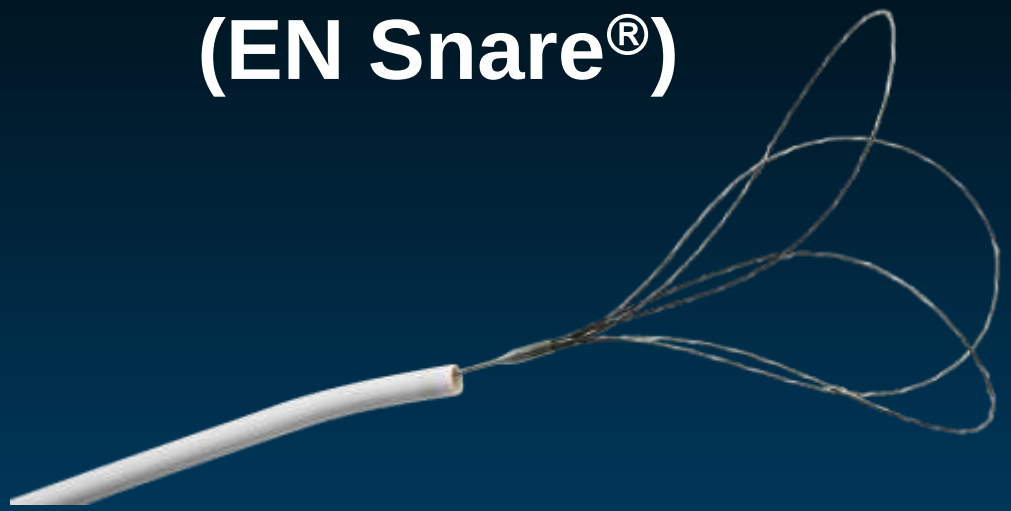




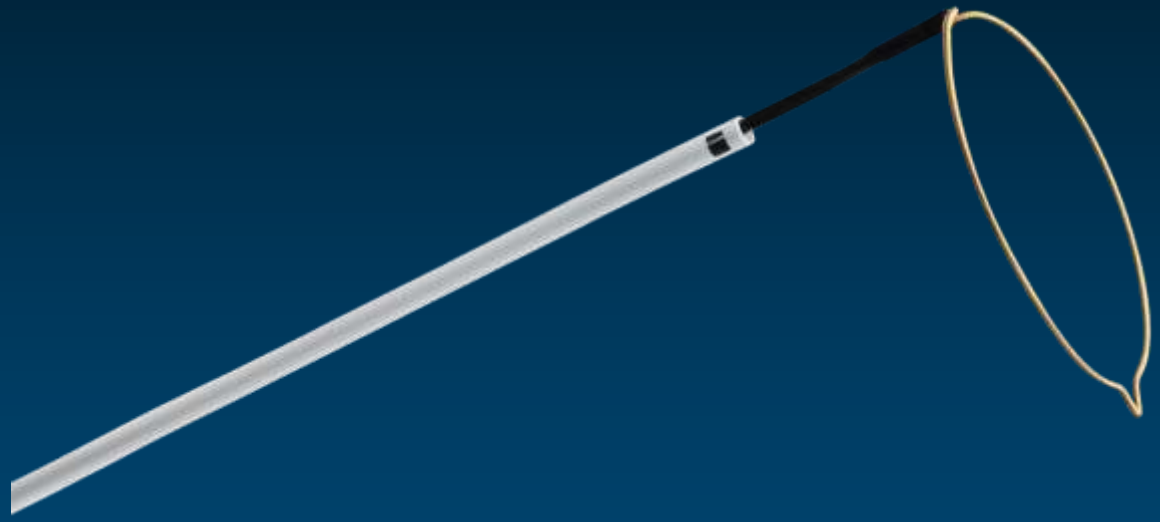
**Complete fracture of 7 Fr JR guide catheter**

# Tools

Three loop snares (EN Snare®)



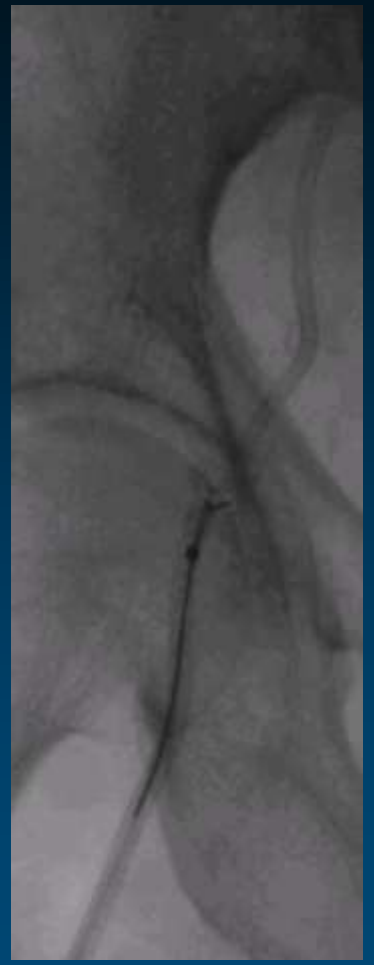
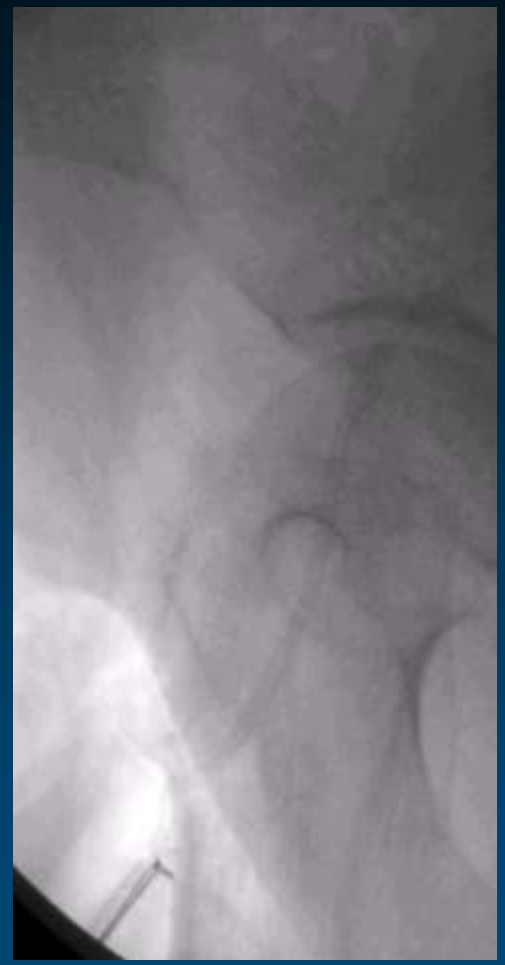
Gooseneck snares



Bioptome – potential arterial damage

# Case - Catheter Fracture (TF)

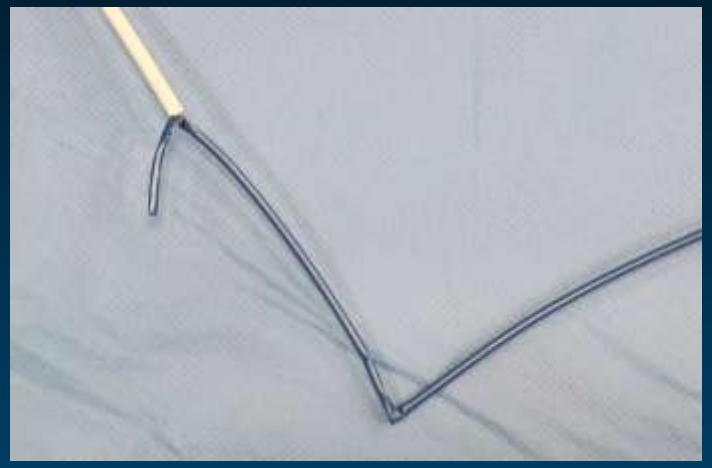


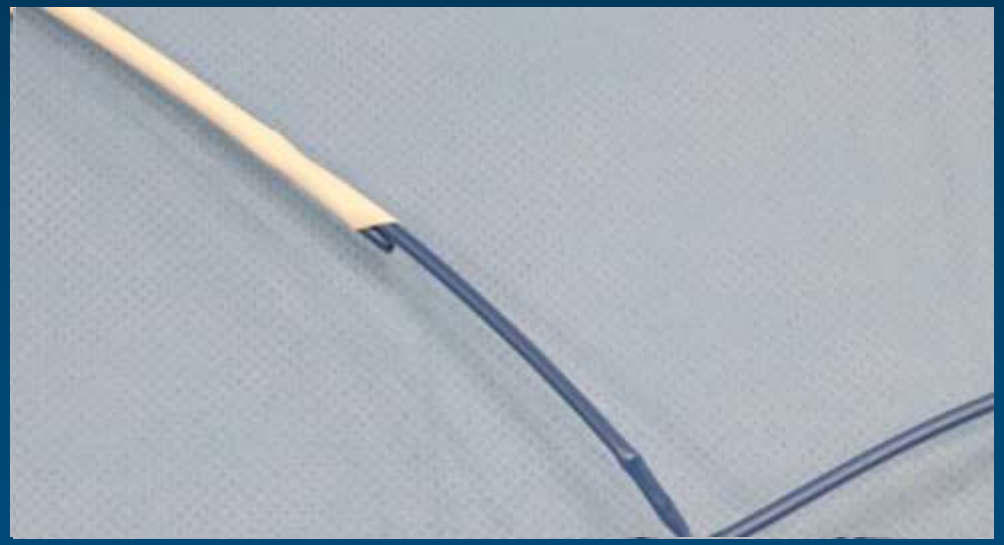



**Replace with  8 Fr sheath → Goose neck snare → Reverse torque → Removal**

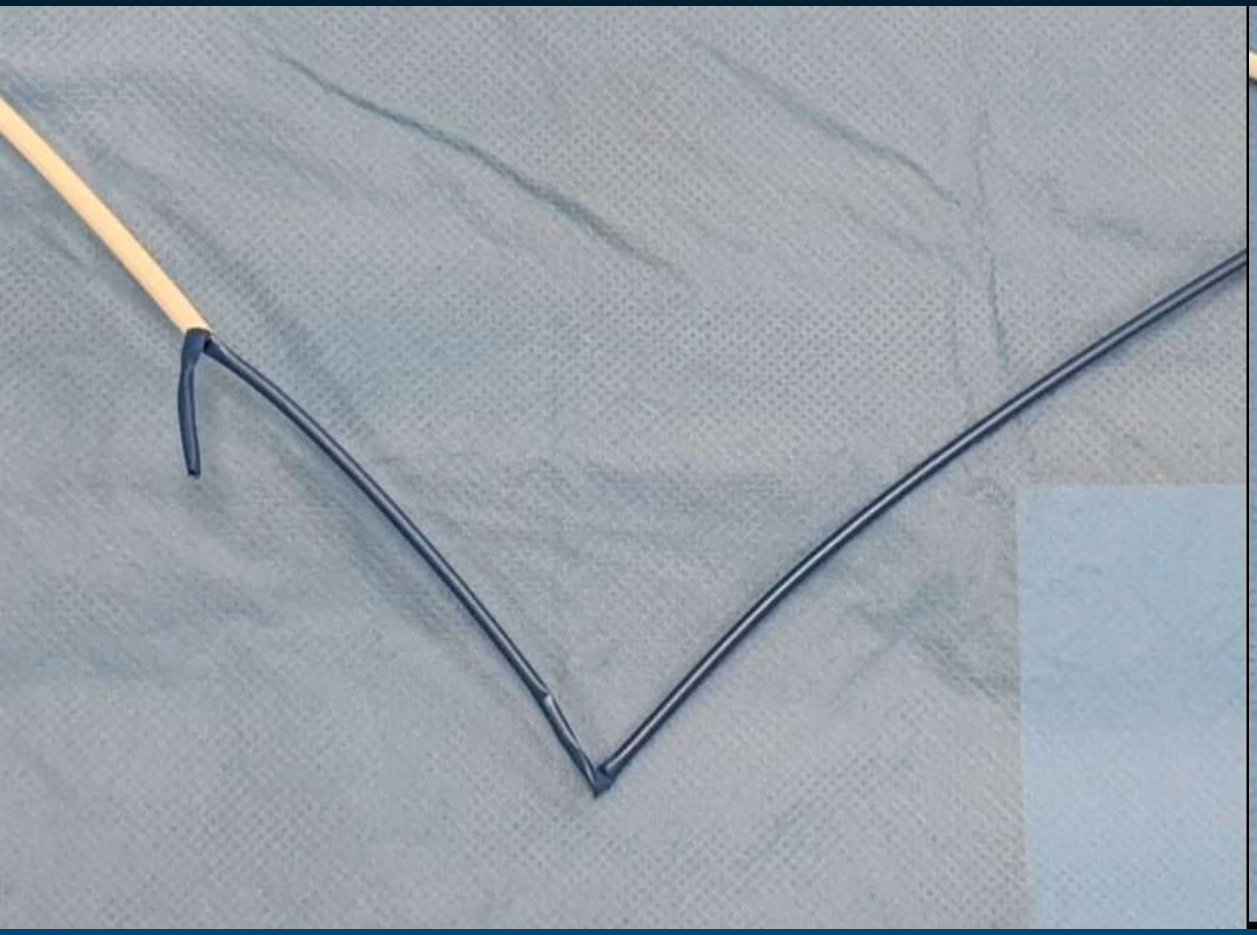
***Partially captured bended catheter → Potentially cause arterial damage***

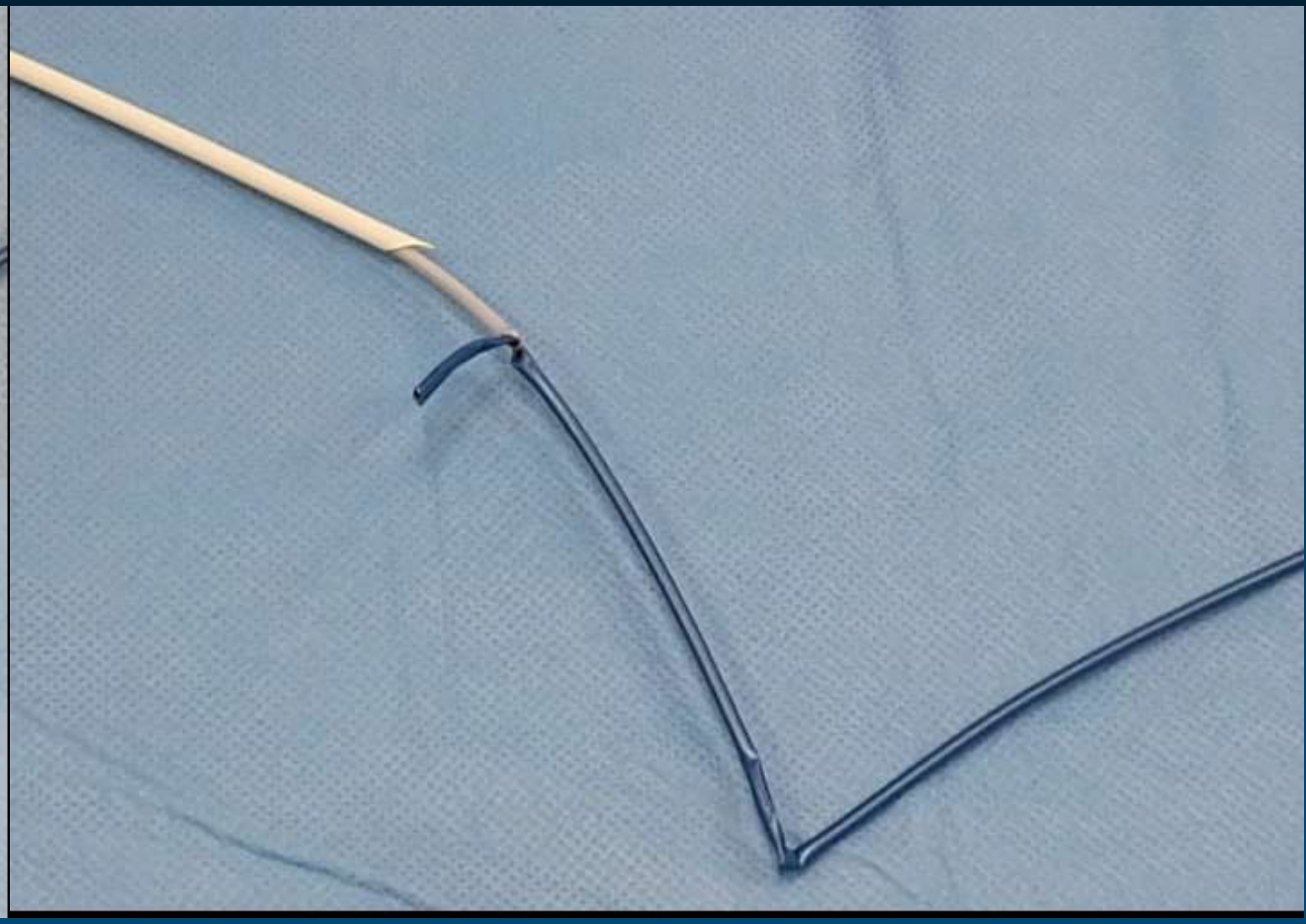
# Treat the Sheath Ends in a Bevel Shape → Enlarges the Sheath Lumen





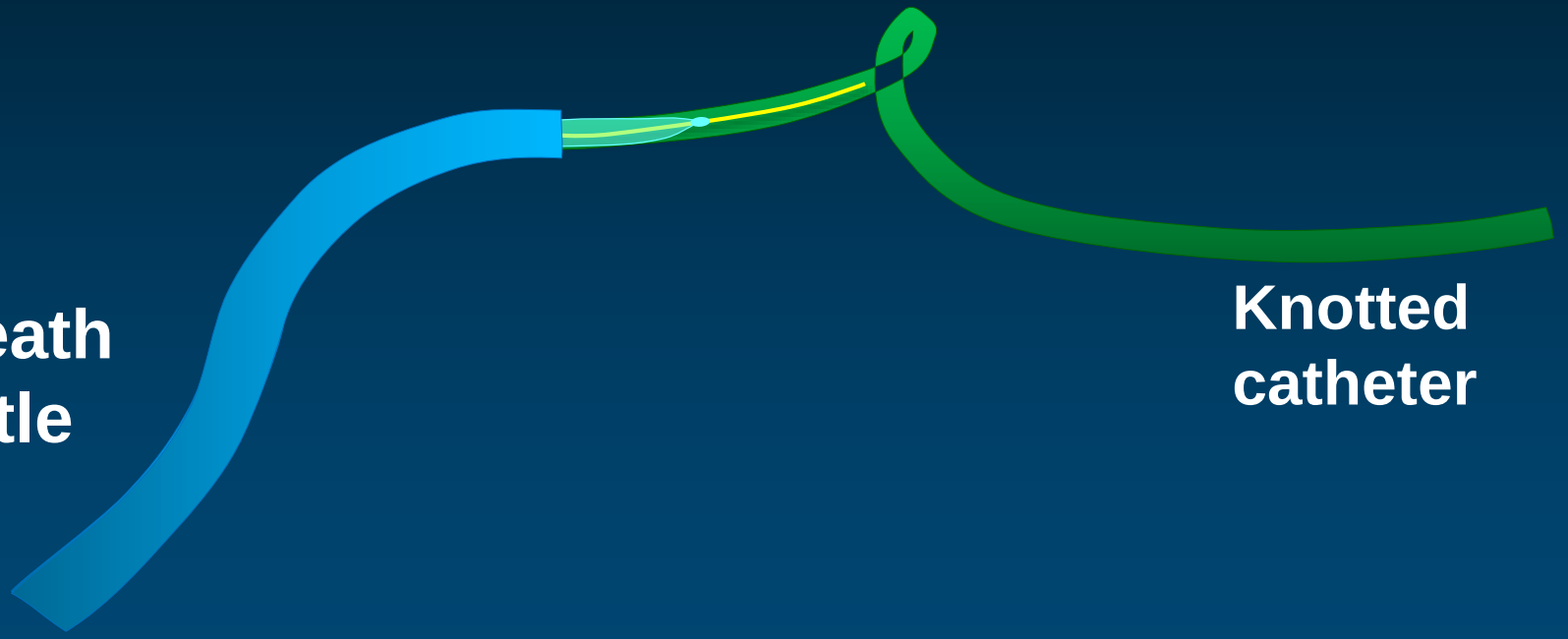
# Treat the Sheath Ends in a Bevel Shape
# → Enlarges the Sheath Lumen





# Balloon-Assisted Retrieval
## *Mother & Child Technique*

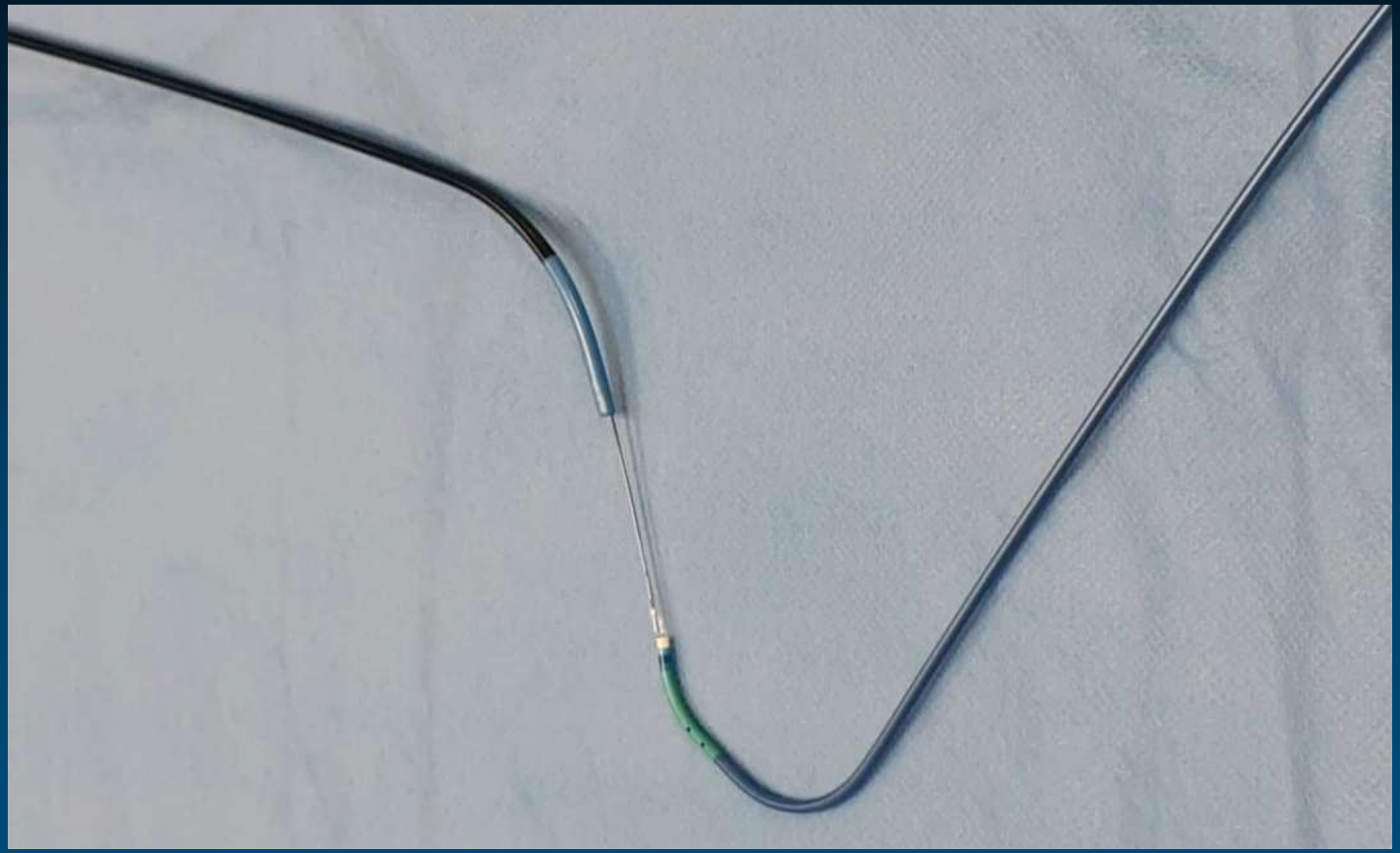
**1-2 Fr bigger sheath**
**e.g.) Ansel, Shuttle**



**Knotted catheter**

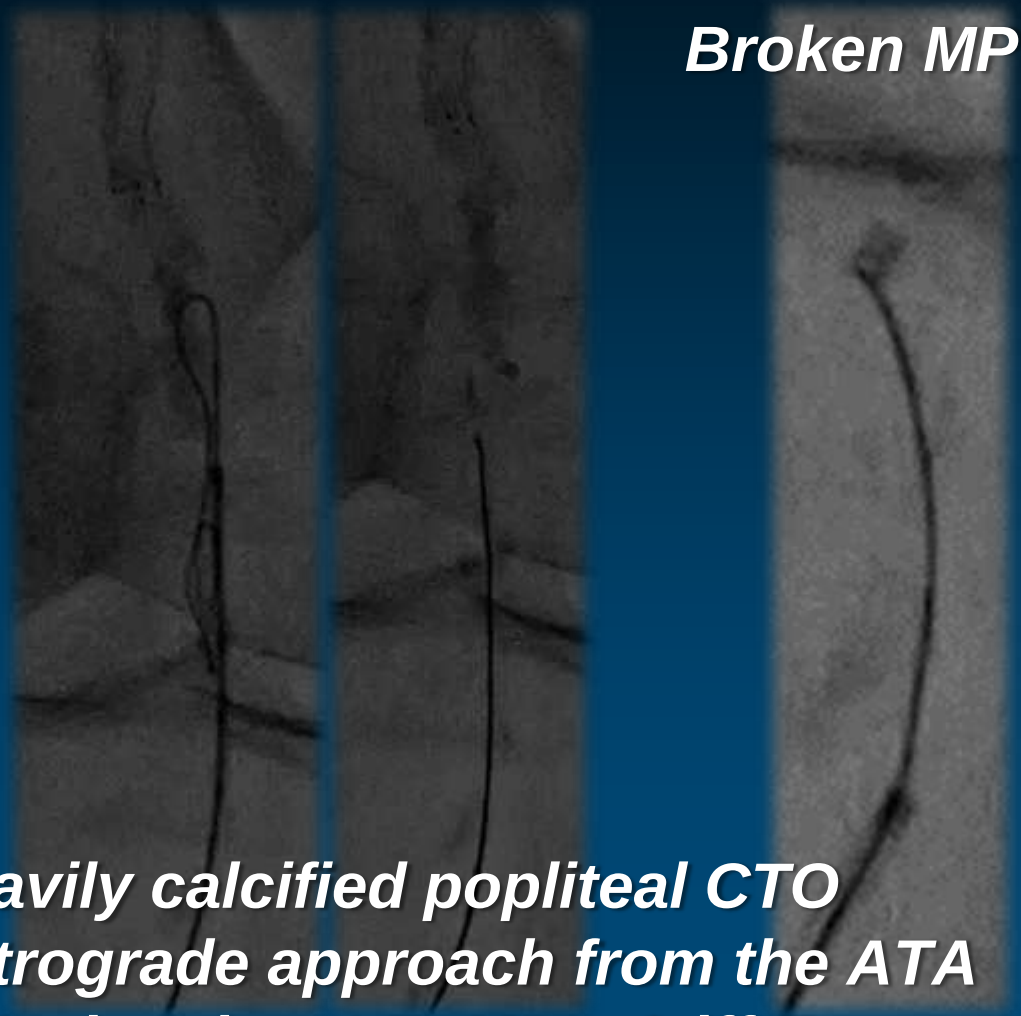
***No catheter bending → Can be removed with a smaller sheath***

# Balloon-Assisted Retrieval
## *Mother & Child Technique*



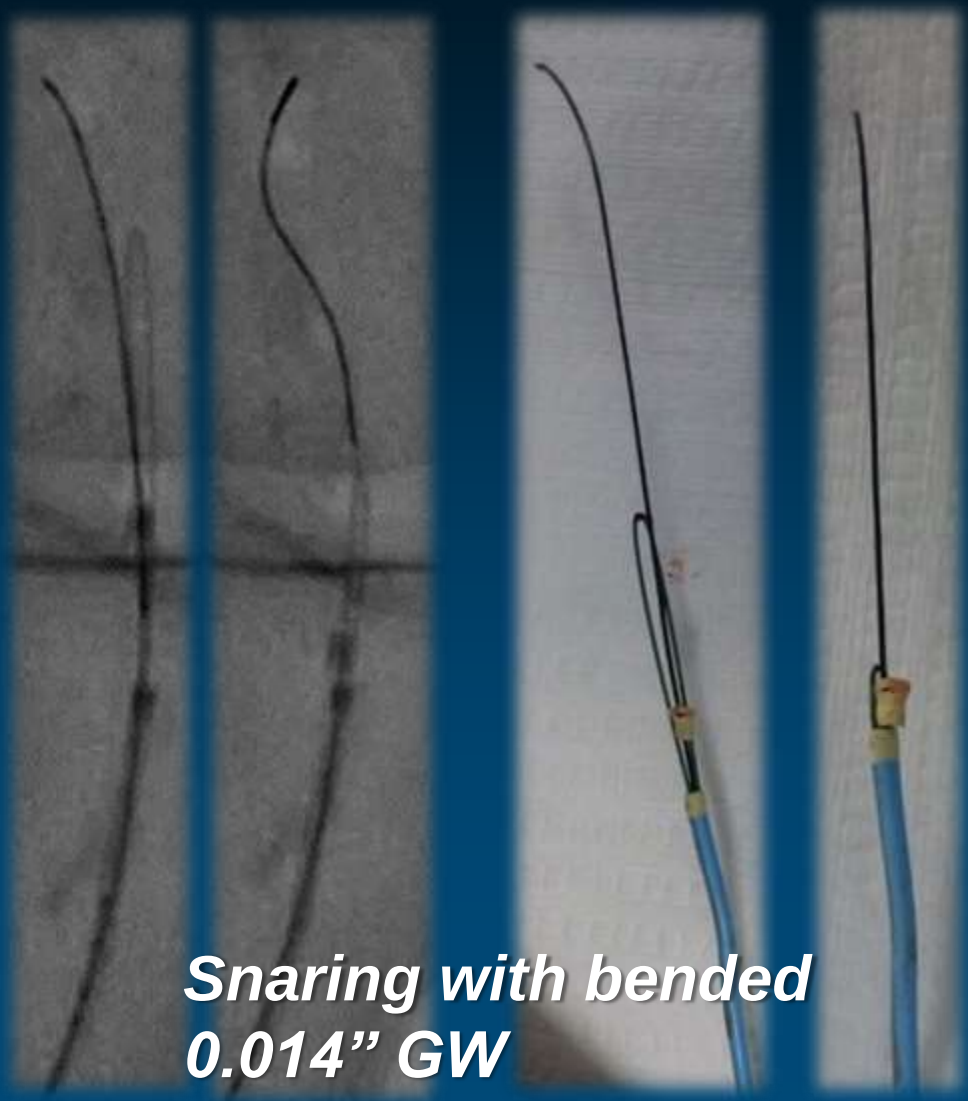
# Snaring with Bended 0.014” GW

## *Broken Catheter Tip During the Retrograde Popliteal CTO Intervention*



*Broken MP tip*

*Heavily calcified popliteal CTO*
*Retrograde approach from the ATA*
*4 Fr sheath + 4 Fr MP + Stiff Terumo*



*Snaring with bended*
*0.014” GW*

# Summary
## *Catheter Knotting*

- Clues: catheter not responding to torque, loss of pressure waveform
- Prevention; reduce torque & increase to-and-fro for catheter manipulat
  - stiff guidewire inside
  - use long sheath or sheathless guide catheter
- Early action; reverse torque, wire, Grandma-Mother-Child Technique
- Second step;
  - External fixation with BP cuff and/or manual manipulation
  - Long sheath / Guide technique – reverse knot
  - Internal fixation with snare – reverse torque
  - Internal fixation with balloon catheter – distal tip

# Summary

## *Catheter Fracture*

- Replace with larger sheath (Diagnostic ≥ 1-2 Fr, Guiding ≥2 Fr)
- Treat the sheath ends in a bevel shape

  → enlarges the sheath lumen
- Snare – goose neck or three loop snares

  Bioptome – can damage arterial wall
- Can be removed from the opposite direction

  - Snare

  - Balloon-assisted mother and child technique